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Establishing the factors affecting treatment success in lung cancer cases presenting with malignant cavity

Factors affecting treatment success in lung cancer cases with a malignant cavity

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Abstract
Aim: Cavitation in lung cancer patients may affect the treatment process and that have the potential to lead to complications. Cavitation complications can be life-threatening. For this purpose, we investigated some clinical characteristics of lung cancer patients with cavitary lesions that we followed up in our clinic.
Materials and Methods: A retrospective examination was made of 54 patients who had been diagnosed with non-small cell lung cancer (NSCLC, squamous-cell lung carcinoma/non-small cell carcinoma) in the Ataturk Chest Diseases and Surgery Training & Research Hospital Palliative Care Unit between 2014 and 2018, and who had a radiological appearance of malignant cavity. The patients' demographic data, weight loss ≥5%, hospitilation status and comorbidities predisposing to pulmonary infection, clinical problems (hemoptysis/ infection), treatment status (completede/ incompleted) were recorded.
Results: In this study, 5% and over weight loss was statistically significantly higher the group that incompleted the treatment (p = 0.014). Completion of treatment was statistically significantly lower in hospitalized patients (p = 0.002). Albumin levels were found to be statistically significantly low in those who could not complete the treatment (p = 0.02).
Discussion: In conclusion, presenting with a cavitary lesion in lung cancer, frequently leads to hospitalization with infection/haemoptysis, and can have an adverse effect on the treatment process. This group of patients should be followed carefully in terms of complications, and care should be taken in terms of side effects of treatment.

Keywords
Lung Cancer, Malignant Cavity, Chemoradiotherapy

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Introduction

Lung cancer is the leading cause of cancer-related death in the world [1]. The stage and pathological type of the tumor are among the main factors determining survival in non-small cell lung cancer; however, comorbidities predisposing to infections, the patient's performance status and any weight loss affecting such status may also have an adverse effect on survival [2], and may negatively affect the treatment process. Cavitation, which also adversely affects the treatment process of patients, is radiologically detected at a rate of 10-20% at diagnosis in lung cancer patients, and is usually associated with ischemia or bronchial obstruction-related tumor necrosis [3]. Tumor cavitation presenting with cough, hemoptysis and recurrent pulmonary infection is common, especially in squamous-cell lung carcinoma, although it may occur with all pathological types of lung cancer [4]. Recurrent pulmonary infections due to treatment complications are common in lung cancer cases with cavitation [5]. Massive pulmonary hemoptysis may occur at a rate of up to 36% in squamous-cell lung carcinoma patients with cavitation [6]. Infection and/or hemoptysis can adversely affect the treatment of patients. Reductions in performance as a result of several complications associated with cavitary lesions in patients diagnosed with high-mortality lung cancer may lead to the suspension or discontinuation of treatment. In light of the above, in the present study, we determine the factors with a potentially adverse effect on the treatment process in patients who were pathologically diagnosed with squamous- and non-small cell lung carcinoma and with radiologically cavitary lesions, and also evaluate the treatment process in such patients.

Material and Methods

The study retrospectively examined 58 patients who were diagnosed with squamous-cell or non-small cell lung carcinoma in our hospital Palliative Care Unit and who had a radiological appearance of a malignant cavity between 2014 and 2018. Patients were staged according to the 8th TNM classification through an examination of computed thoracic tomography / 18F-fluorodeoxyglucose positron emission tomography scans. Patient files were examined, and the Eastern Cooperative Oncology Group (ECOG) performance statuses were recorded. Patients were reviewed in terms of chronic obstructive pulmonary disease (COPD) and diabetes mellitus (DM), as conditions with a predisposition to infection. Other examined variables included demographic data (age, gender, smoking status), cell types, stages, lesion regions, weight loss (5% weight loss in the last 3 months), laboratory findings (CRP, leukocyte, neutrophil and albumin levels), scheduled treatment, the status of hospitalization, reasons for hospitalization, status of culture growth and status scheduled treatment completion. Clinical conditions interfering with the treatment of patients and requiring hospitalization were classified under three (3) groups, the status of infection, the status of hemoptysis, and both. Treatment completion status was classified under two (2) groups based on the effect of such conditions on treatment. The first group consisted of patients who successfully completed the treatment; and the second group consisted of those who did not complete the treatment (treatment was delayed/never initiated/discontinued).

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Statistical Analysis

Descriptive statistics were used for the demographic data of the study. When the patients were grouped according to the completion of the treatment, Student's t-test was used for continuous data and Chi-square test were used for discrete data. P-value <0.05 was considered statistically significant.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

The mean age of the study participants was 63±8.1 years. Among the 54 patients, 52 (96.3%) were male and 2 (3.7%) were female. Weight loss was ≥5% in 37 (68.5%) patients, and not in 17 (31.5%) patients. Histopathologically, most patients had been diagnosed with squamous-cell carcinoma (n=48;

Table 1. Characteristics of study population.

Characteristics	Number (%)	Mean±SD
Gender		
Female	2 (3,7%)	
Male	52 (96,3%)	
Age±SD		63±8,1
Histopathology		
SCC[1]	48 (88,8%)	
NOS[2]	6(11,2%)	
Reason for hospitalisation		
Infection	33 (89,1%)	
Haemoptysis	2(5,4%)	
Both	2 (5,4%)	
Treatment modalities[3]		
Chemotherapy	12(%22,2)	
Chemoradiotherapy	35(%64,8)	
Localisation of tumor		
Left upper lobe	16(%29,6)	
Lingula	2(%3,7)	
Left lower lobe	4(%7,4)	
Right upper lobe	23(%42,6)	
Right middle lobe	2(%3,7)	
Right lower lobe	7(%12,9)	
Existence of COPD[3]		
Yes	23(%42,5)	
No	31(%57,5)	
Existence of DM[4]		
Yes	6(%11,2)	
No	48(%88,8)	
Albumin		3,6±5,9
CRP		6,2±32,5
Weight loss		
Yes	37(%68,5)	
No	17(%31,5)	
Hospitalization		
Yes	37(%68,5)	
No	17(%31,5)	

[1]SCC: Squaomous cell carcinoma, [2]NOS: Not other wised specified, [3]COPD: Chronic obstructive pulmonary disease, [4]DM: Diabetes Mellitus

Table 2. Patient characteristics according to treatment completion status.

	Treatment completed (n,%)	Treatment incompleted (n,%)	P value
Gender			
M/F	27.1	25.1	P>0,05
Weight loss			
Yes	15 (%28)	22 (%41)	P=0,014
No	13 (%24)	4 (%7)	
COPD			
Yes	9(%17)	14(%26)	P>0,05
No	19(%35)	12(%22)	
DM			
Yes	3(%5)	2(%3)	P>0,05
No	25(%47)	24(%45)	
Hospitalization			
Yes	14(%26)	23(%43)	P=0,002
No	14(%26)	3(%5)	
Albumin levels	3,79	3,3	P=0,02

88.8%) and six patients (11.2%) had NOS. Most patients had early stage and local advanced disease (n=41). Lesions were located radiologically in the right upper lobe in 23 (42.6%) patients and in the left upper lobe in 16 (29.6%) patients. Mean CRP was 6.2±32.5, the white blood cell count was 10.0±4.2 and the mean neutrophil count was 6.7±3.5. Chronic obstructive pulmonary disease (COPD) and diabetes mellitus (DM) were detected in 23 and 6 patients, respectively. The distribution of treatments of the study population revealed that most underwent CRT with 35 (64.8%) cases, while 12 (22.2%) cases underwent CT. Treatment distribution is summarized in Table 1. Of the total, 37 patients were hospitalized during treatment. The reason for hospitalization was infection in 33 patients, hemoptysis in two patients, and both infection and hemoptysis in two patients. While initially planned treatment started smoothly in 31 patients, it was delayed in 15 patients, never performed in 5 patients, and was discontinued after starting treatment in 3 patients. While treatment was successfully completed in 28 patients, treatment was not completed in 26 patients. In the group that could not complete the treatment, weight loss of 5% and over was statistically significantly higher than in the group that completed the treatment (p = 0.014). There was no statistically significant difference between patients' completion of treatment according to T staging (p> 0.05). There was no statistically significant difference between the presence of COPD and DM and completion of treatment in patients (p> 0.05). Completion of treatment was statistically significantly lower in hospitalized patients (p = 0.002). There was no statistically significant relationship between CRP, white blood cell, neutrophil levels and completion of treatment (p> 0.05). However, albumin levels were found to be statistically significantly low in those who could not complete the treatment (p = 0.02) (Table 2). There was no statistically significant difference between the location of the lesion and the completion of the treatment (p> 0.05).

Discussion

About 10-20% of lung cancer cases present with tumor cavitation radiologically, which is attributed to ischemia and/or tumor necrosis [3]. Previous studies have shown that lesions in cavitary lung cancer cases are often large and located at the periphery. Such tumors typically emerge with an increase in cough, sputum and infection parameters [5, 7]. The present study found that cavitary lesions tended to be located in the right upper lobe and left upper lobe, but did not establish any statistically significant association between lesion localization and the status of treatment completion (p>0.05). The increase in T stage compared to 8.TNM staging in lung cancer is an indication of poor prognosis, prognosis and survival [8]. In our study, no statistically significant difference was found between patients' completion of treatment according to T staging (p> 0.05). This indicates that the size of the cavitary lesions of the patients did not contribute to the completion of the treatment. Previous studies have reported that weight loss ≥5% is common in lung cancer patients with cavitary lesions, and that overall survival (OS), progression-free survival (PFS) and prognosis are poorer in patients with weight loss and anemia [9,10]. In lung cancer patients malnutrition is associated with a higher risk of developing complications and with mortality, sometimes lengthening the hospital stay [11]. In our study, it was found that the completion of the treatment was statistically significantly lower in patients with weight loss of 5% or more. Treatment termination was statistically significantly higher in patients with weight loss of 5% or more in patients who could start treatment (who started treatment smoothly and postponed treatment) compared to those who did not lose weight. The present study established the presence of weight loss ≥5% as a factor that may interfere both with the initiation and continuance of treatment. Studies have shown that hypoalbuminemia causes loss of appetite and fatigue, increases the side effects of chemotherapy and has a negative effect on the treatment process[12]. In our study, it was observed that patients with low albumin levels were statistically significantly higher in the group who could not complete the treatment. For this reason, it is important to provide nutritional support to this patient group starting from the diagnosis stage in the patient group with cavitary lesions, which are very difficult to manage. Previous studies report that cavitary tumors lead to complications with infections that may be difficult to treat due to chemotherapy and/or radiotherapy [5]. These possible complications during treatment adversely affect the treatment process in cases of lung cancer with cavitary lesions, and sometimes cause problems with such high mortality rates that treatment cannot be completed. In such patients, immunosuppression related to chemo and/or radiotherapy causes a predisposition to infection, and resistant microbial agents may grow in the cultures. Furthermore, the reduced vascular blood supply in the cavity and turning into a growth medium complicates the treatment of infection in such patients, leading to an adverse effect on the treatment process. This results in a decrease in performance status and failure to complete treatment. The present study demonstrated that hospitalization with infections at the outset or during treatment was frequent in lung cancer cases with cavitary lesions, and negatively affected the treatment process in such patients.

In our study, it was observed that the hospitalization status of the hospitalized patients was statistically significantly lower.

Due to its potential to interfere both with the initiation and termination of the treatment, patients with cavitary lesions should be monitored carefully, especially in terms of potential infections during the treatment process. In a previous study, poorer mean and overall survival rates and poorer prognosis were identified in cases of early cavitary lung cancer that had undergone a resection. The same study also identified wider vascular invasion and tumor size with cavitary tumors [13]. Poor prognosis and survival in lung cancer cases with cavitary lesions may be attributed to the tumor being radioresistant and aggressive [14], although the frequency of infections in such patients may adversely affect prognosis and survival. Related to this issue, a previous study identified frequent microbial growth in the transthoracic aspiration cultures of pyretic cancer patients with cavitary lesions [15]. In the present study, no statistically significant relationship was found among CRP, white blood cell, neutrophils and the status of completing the treatment ($p>0.05$). Additionally, there was no statistically significant association between the presence of COPD, which is a poor prognostic factor in lung cancer cases that is likely to have a negative effect on the treatment process, and the status of treatment completion. That said, treatment could be initiated without problem only in eight of the 23 patients diagnosed with COPD [16] ($p>0.05$), although this may be attributed to the low number of patients.

Conclusion

In conclusion, the presence of a cavitary lesion in lung cancer leads to frequent hospitalization with infections, and can potentially have an adverse effect on treatment. Weight loss and hypoalbuminemia have a negative effect on the process of completing treatment. In this regard, patients should be followed closely, treatment for infections with high mortality should be given early, nutritional support should be evaluated and patients with low performance status should be evaluated for follow-up with supportive treatment.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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